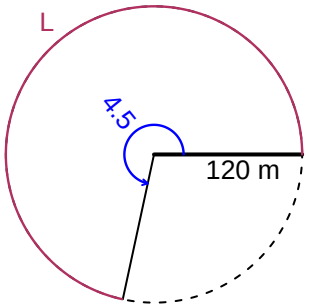
Name: Date:

Trig Final (Solution v13)

- You should have a calculator (like Desmos) and a unit-circle reference sheet.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 4.5 radians. The radius is 120 meters. How long is the arc in meters?

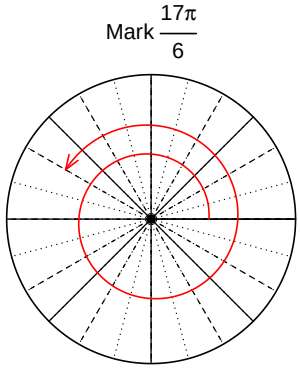


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

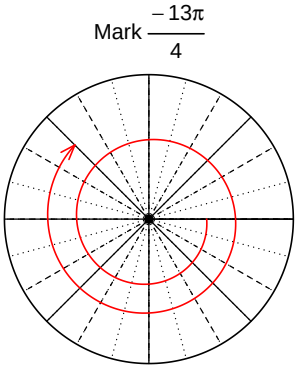
$L = 540$ meters.

Question 2

Consider angles $\frac{17\pi}{6}$ and $\frac{-13\pi}{4}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\cos\left(\frac{17\pi}{6}\right)$ and $\sin\left(\frac{-13\pi}{4}\right)$ by using a unit circle (provided separately).



Find $\cos(17\pi/6)$



Find $\sin(-13\pi/4)$

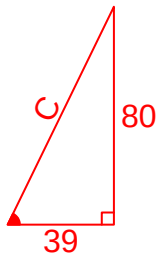
$\cos(17\pi/6) = \frac{-\sqrt{3}}{2}$

$\sin(-13\pi/4) = \frac{\sqrt{2}}{2}$

Question 3

If $\tan(\theta) = \frac{-80}{39}$, and θ is in quadrant II, determine an exact value for $\sin(\theta)$.

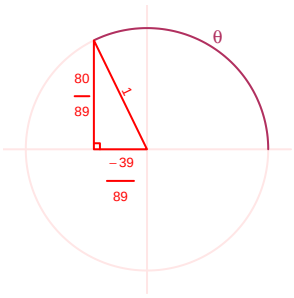
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$39^2 + 80^2 = C^2$$
$$C = \sqrt{39^2 + 80^2}$$
$$C = 89$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant II in a unit circle.



$$\sin(\theta) = \frac{80}{89}$$

Question 4

A mass-spring system oscillates vertically with an amplitude of 6.7 meters, a frequency of 8.44 Hz, and a midline at $y = -3.53$ meters. At $t = 0$, the mass is at the midline and moving down. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -6.7\sin(2\pi 8.44t) - 3.53$$

or

$$y = -6.7\sin(16.88\pi t) - 3.53$$

or

$$y = -6.7\sin(53.03t) - 3.53$$